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AUTHOR	Lewiski, Raymond L.
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ABSTRACT

This document begins with an outline of events seen as noteworthy in the search for fairness in general and includes a brief discussion of the Civil Rights Act of 1964, the Equal Employment Opportunity Act of 1972, and the Tower Amendment (Title VII). These events are placed in perspective with recent events which have impacted the notion of fairness as it relates to the process of employment testing and hiring. The legislative acts are seen as ground rules, and fairness in testing is seen as a legal mandate. Axiological models for fairness in employment testing which have been proposed during the last ten years include the Traditional Selection Strategy (based on a simple regression model); the Quota Model, the Equal Risk Model, the Regression Model, the Constant Ratio Model, the Subjective Regression Model, the Conditional Probability Model, the Equal Probability Model, the Converse Equal Risk Model, the Converse Constant Ratio Model, the Threshold Utility Model, the Converse Conditional Probability Model, the Converse Equal Probability Model, and the Normal Ogive Model. The dominant value commitment associated with each model is identified and current proposed solutions to the problem of fairness in occupational selection are discussed. Finally, each model is applied to a hypothetical employment situation and its dominant value is highlighted. (Author/JAC)

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EXTENSION COURSE INSTITUTE

THE SEARCH FOR FAIRNESS IN TESTING

By

Dr. Raymond L. Lewiski

Extension Course Institute
Gunter AFS, AL 36118

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THE SEARCH FOR FAIRNESS IN TESTING

by
Raymond L. Lewiski
Education Specialist

Extension Course Institute
Air University

ABSTRACT

This article is divided into two parts: the historical prelude and the search for fairness. The article begins with a brief historical acknowledgement of noteworthy events that have fostered a general sense of fairness within our cultural heritage. Specifically cited are the 1964 Civil Rights Act and the Equal Employment Opportunity Act of 1972. These are placed in perspective with recent events that have impacted on the notion of fairness as it relates to employment testing. The article shows how these legislative acts set the ground rules that are to be followed in the search for fairness in testing. The historical prelude is concluded with fairness in testing viewed as a legal mandate as well as a desirable social goal.

Next, the search for fairness in testing is begun by a review of noteworthy axiological models of fairness in testing that have been proposed during the last ten years. For each model reviewed, the concept of fairness that logically follows is described and the dominant value commitment associated with the model is identified. Finally, each model is applied to a hypothetical employment situation and its dominant value is highlighted.

THE SEARCH FOR FAIRNESS IN TESTING

Historical Prelude

The notion of fairness as a social goal is steeped in American tradition. The Magna Carta, the Declaration of Indpendence, the Emancipation Proclamation, the Civil Rights Act of 1964, and the Equal Employment Opportunity Act of 1972 are all social events that have advocated a sense of fairness and shaped the American heritage. Although each of these events has contributed to a general sense of fairness, the issues of fairness in testing were not addressed until 1964.

The 1964 Civil Rights Act and the Equal Employment Opportunity Act of 1972 are of particular importance to fairness in testing as sections of both acts have dealt directly with the question of how tests are to be used. During 1964, Civil Rights legislation was being debated in Congress and the question of unlawful employment practices was also raised and debated. During debate on this issue, an amendment was introduced by Senator Tower of Texas (later to become the Tower Amendment to Title VII of the Civil Rights Act of 1964). The Tower Amendment was embodied in Section 703(h) of Title VII of the act and reads as follows:

> Nor shall it be an unlawful employment practice for an employer to give and act upon the result of any professionally developed ability test provided that such test, its administration or action upon the results is not designed, intended or used to discriminate because of race, color, religion, sex, or national origin.[1]

The Tower Amendment has had considerable impact on public policy toward the use of tests, and has been the center of much controversy. Shortly after the 1964 Act became law, the wording of the amendment led to a controversy over the use and meaning of the term "ability test." The question was raised of whether a legal interpretation of the term "ability test" was to include broad general abilities that tend to measure the person in the abstract, or be restricted to specific job-related abilities that could be empirically verified. In other words, were mental ability tests or intelligence tests also classed as "ability tests"? Members from both the psychological and legal professions were in disagreement over how the term "ability test" was to be interpreted. An answer to this question was not easily forthcoming.

The controversy was settled in part by the case of Willie S. Griggs et al., Petitioners., vs Duke Power Company. The Griggs vs Duke Power Company case was decided in the U. S. Supreme Court on 8 March 1971. The court ruled that tests used for the purpose of making employment decisions were required by law to be job-related, and the burden of proving job-relatedness was placed on the employer.

Justice Burger interpreted Congressional intent as follows:

> Nothing in the act precludes the use of testing or measuring procedures; obviously they are useful. What Congress has forbidden is giving these devices and mechanisms controlling force unless they are demonstrably a reasonable measure of job performance. Congress has not recommended that the less qualified be preferred over the better qualified simply because of minority origins. Far from disparaging job qualifications as such, Congress has made such qualifications the controlling factor so that race, religion, nationality, and sex become irrelevant. What Congress has commanded is that any tests used must measure the person for the job and not the person in the abstract.[2]

This historic decision provided a basis for one of the ground rules of employment testing: a test must be job-related. Other ground rules resulted from guidelines that were written by agencies established by the 1964 Civil Rights Act and the 1972 Equal Employment Opportunity Act.

The Equal Employment Opportunity Act of 1972 (Public Law 92-261) amended Title VII of the Civil Rights Act of 1964, expanding its coverage and adding enforcement powers. Section 706(a), as amended, empowered the commission to prevent any person from engaging in any unlawful employment practices as set forth in Section 703 (Discrimination because of Race, Color, Religion, Sex, or National Origin) and Section 704 (Other Unlawful Employment Practices). Another change affected the Attorney General's Office. Cases involving a government, governmental agency, or political subdivision were charged to the Attorney General. Section 707(c), as amended, provided for the commission's assumption of the functions that were previously charged to the Attorney General and his office. These functions were to be assumed within two years after the date of enactment of the Act.

Another important portion of the 1972 EEO Act was Section 715. This section provided for the establishment of the Equal Employment Opportunity Coordination Council (EEOCC) whose membership is composed of the following five heads of government agencies or their respective delegates:

1. Secretary of Labor
2. The Chairman of the Equal Employment Opportunity Commission.
3. The Attorney General
4. The Chairman of the United States Civil Service Commission.
5. The Chairman of the United States Civil Rights Commission.

The responsibilities of the EEOCC are described in Section 715 as follows:

> The Council shall have the responsibility for developing and implementing agreements, policies and practices designed to maximize effort, promote efficiency, and eliminate conflict, competition, duplication and inconsistency among the operations, functions and jurisdictions of the various departments, agencies and branches of the Federal government responsible for the implementation and enforcement of equal employment opportunity legislation, orders, and policies. On or before July 1 of each year, the Council shall transmit to the President and the Congress a report of its activities, together with such recommendations for legislative or administrative changes as it concludes are desirable to further promote the purposes of the section.[3]

The extent to which the EEOCC has been able to carry out its responsibility is an open question. A new set of guidelines has been proposed and was published in the Federal Register on the 14th of July 1976. However, no attempt was made to obtain concurrence from one member, the Civil Rights Commission, on the proposed guidelines, and another member, the Equal Employment Opportunity Commission, maintains that the guidelines do not represent the position of that agency. In spite of their differences, all members of the EEOCC agree that a uniform set of guidelines ought to be established.

In the final analysis, both the 1964 Civil Rights Act and the 1972 Equal Employment Opportunity Act have had considerable impact on the way tests are to be used, and each has contributed to the establishment and maintenance of a sense of fairness with respect to testing. In effect, these acts have placed the issue of fairness boldly before the test user. A contemporary user of tests may view these acts as desirable and needed social goals or as a legal obligation. Regardless of point of view the user cannot escape the issue of fairness.

The Search for Fairness

At first encounter, the notion of fairness is a nebulous concept that permeates both the employment decision-making process and the possible consequences that may result from the decisions that are made. The question of fairness may be raised at any stage of what may be referred to as the overall selection process; however, some points within the process are more crucial to fairness than others.

The Overall Selection Process

An outline of the overall selection process is given in figure 1 where the selection process is divided into two stages: a decision-making stage and a possible-outcomes stage. The decision-making stage is subdivided into three substages comprising tasks to be performed. These are as follows: (1) the identification and stratification of the population for which an employment decision is to be made. The Uniform Guidelines on Employee Selection procedure suggest that the population be identified and stratified by sex, race, and ethnic groupings. Also, the Guidelines define employment decisions as follows:

> Employment decisions include but are not limited to hire, additional compensation or promotion, demotion, membership (for example in a labor organization), referral, retention, licensing and certification, to the extent that licensing and certification may be covered by Federal equal employment opportunity law. Employment decisions may also include transfer, job or work assignments, or training if they are used as a basis for additional compensation.[4]

(2) the gathering and validation of types of information to be used for making employment decisions. According to the Uniform Guidelines on Employee Selection procedure, this includes the following types of information:

> Any measure, combination of measures, or procedure, other than a bona fide seniority system, used as a basis for any employment decision. Selection procedures include the full range of assessment techniques from traditional paper and pencil tests, performance tests, training programs or probationary periods and physical. Educational and work experience requirements through informal or casual interviews and unscored application forms.[5]

(3) the identification and use of strategies for decision making. At this substage, each of the axiological models of fairness reviewed in this paper is an example of a unique strategy.

Insofar as possible, the tasks to be performed in the decision-making stage are logically ordered. For instance, the requirement that there be a population on which an employment decision is to be made is logically prior to the task of gathering information. Likewise, before a decision-making strategy can be used, there must be valid information available. Also, it may be noted that the logical ordering of the tasks would permit fairness to be jeopardized before its consideration at a later stage of the overall selection process. For example, if the prior task of test validation were not properly performed, the later task of making an employment decision has dubious fairness.

The second stage within the overall selection process consists of a breakdown of possible outcomes. These are shown in the lower part of figure 1. Possible outcomes impact on either an individual or a job to be performed, and an analysis of outcomes is considered essential to any notion of fairness. The first possible outcome is that a person is initially selected for favorable treatment or not selected. Favorable treatment is considered as any change in a person's situation or status that is advantageous for that person. Being selected for favorable treatment does not mean that one will reap the benefits of a change in his or her situation. For example, with respect to job openings, there may be more job openings than there are qualified candidates to fill them or there may be more qualified candidates looking for jobs than there are job openings. In the former case, all persons selected for favorable treatment would most likely reap the benefits of an improved situation, while in the latter case, some would not. The final outcome considered with respect to recipients of favorable treatment pertains to the beneficiary's later performance on the job. Here there are two possibilities: a person's job performance will be either acceptable or not acceptable. For those persons whose situations remain the same, their final outcome may be reviewed from various points of view: psychological, social, economic, legal, political, etc.

THE OVERALL SELECTION PROCESS

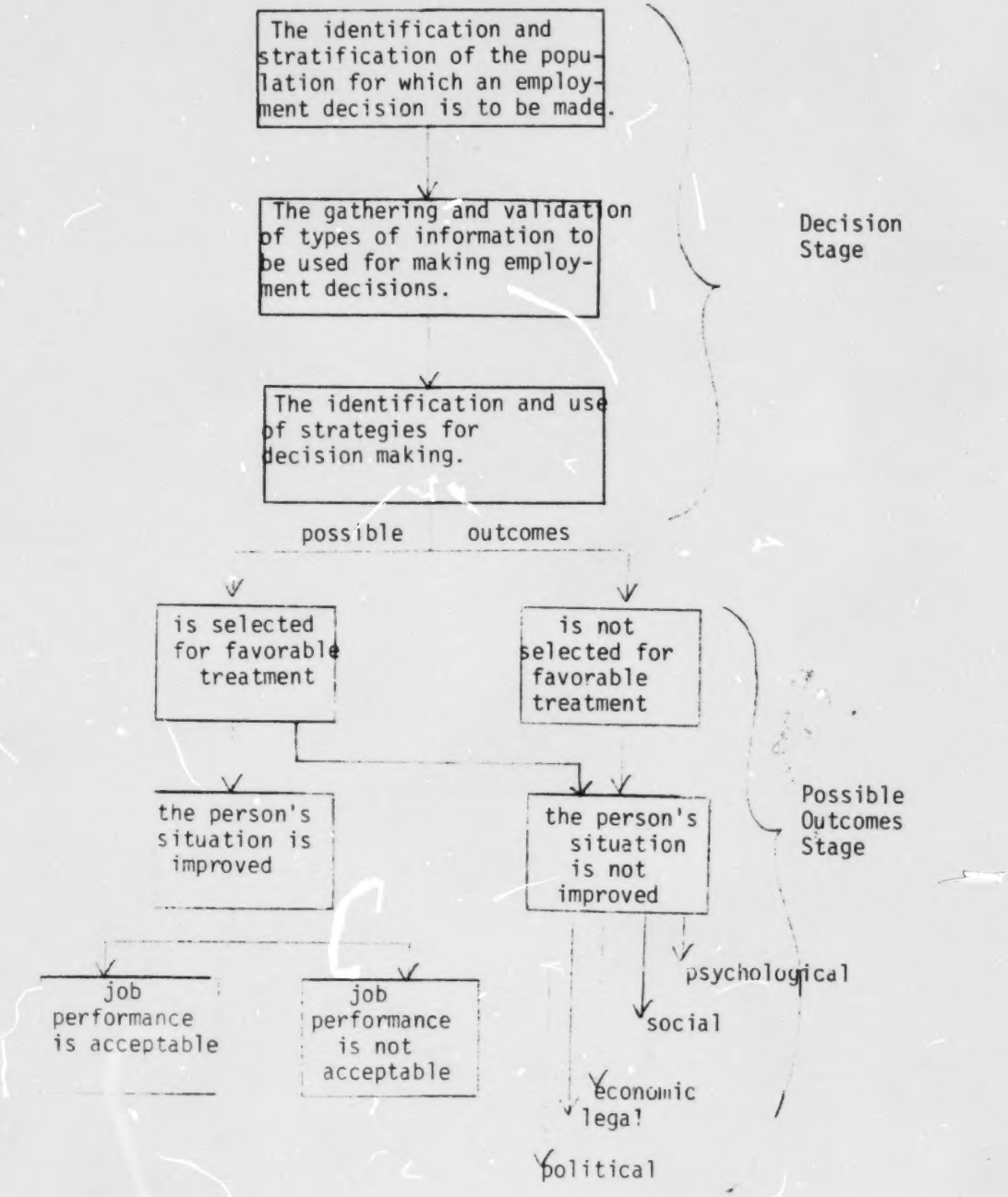
The identification and stratification of the population for which an employment decision is to be made.
The gathering and validation of types of information to be used for making employment decisions.
The identification and use of strategies for decision making.
Decision Stage
possible outcomes
is selected for favorable treatment
is not selected for favorable treatment
the person's situation is improved
the person's situation is not improved
Possible Outcomes Stage
job performance is acceptable
job performance is not acceptable
psychological
social
economic
legal
political

Figure 1

A thorough search for fairness would require close scrutiny of all stages and substages of the overall selection process. This paper will consider only that portion of the selection process that begins at substage 3 of the decision stage and continues through most of the outcome stage. In all cases in which fairness is discussed, it will be assumed that the first two tasks in the decision stage have been properly performed. In a real life situation, this assumption would not be permitted but for the hypothetical situations that will be considered here the assumption is in order.

Currently, the most discussed and debated segment of the overall selection process is the third substage of the decision-making stage. It is at this substage that most disagreement begins. Most professional developers and users of tests agree with the social goal of fairness in testing and welcome the legal requirements of an affirmative action program. They disagree, however, on what constitutes "fairness in testing" and how "fairness" can best be measured.

During the last ten years, a number of definitions have been suggested for "fairness in testing" and various models have been proposed for measuring fairness best. Seven such models will be reviewed in this paper. This review will be made from a practitioner's point of view. No attempt will be made to spawn a new model of fairness. Also, insofar as possible, the review will be literary and at all times an attempt will be made to minimize the use of mathematical symbols. An attempt will be made to answer questions about past models used, what is being done now and what we can expect for the future.

For each model reviewed, the dominant value commitment associated with the model will be identified and the concept of fairness that logically follows will be described. Then, each model will be applied to a hypothetical employment situation and its dominant value will be highlighted.

The Traditional Selection Strategy

Before the 1964 Civil Rights Act was passed, relatively little had been written about fairness in testing and the issue of the fairness of a selection strategy had not been raised. At this time, it was generally concluded that a selection strategy based on a simple regression analysis was essentially fair and the only axiological model seriously advocated was a straightforward, uncomplicated regression model. Later variations of this model were to consider the applicant's sex, race, and ethnic affiliation and were more complex. The traditional model was based on a simple regression analysis in which the regression of a job

performance criterion Y on a text score X was determined for a general population first; then, after having established the regression of Y on X, the resulting regression weights were used to predict an expected job performance score Y' for each new job applicant. Letting (a) equal the intercepts and (b) equal the slope, the simple regression equation was $Y' = a+bX$.

The regression model has traditionally been advocated by people who were primarily concerned with the maximization of their ability to select job applicants who would most likely be successful on the job. Consequently, this model favors the high scoring applicant on text X. Using this strategy, the applicant with the highest predicted score Y' would be hired first, the next highest second, and so on till all job vacancies were filled. This is an ideal selection strategy from an employer's point of view but, for applicants concerned with their equal employment opportunity or a group-oriented individual, a different strategy would most likely be preferred.

After the 1964 Civil Rights Act became law, the basic questions of fairness in testing and selection were quickly raised in court, and it was during this period time that fairness of the regression model was first seriously challenged. Three criticisms were leveled against traditional selection strategies. It was argued that they were inappropriate for dealing with social conditions created by a long past history of job discrimination. It was repeatedly pointed out by minority groups that, when such strategies were used as a basis for making employment decisions, they did not provide each person with an equal opportunity of being selected. It was pointed out that traditional strategies of selection were essentially fair to an individual within a group or class but unfair to the group or class as a whole.

The Quota Model

The arena of fairness in testing was moved to the courts and, in response to the first criticism noted above, a quota model was brought into play. The quota model was invoked on numerous occasions in the courts when a clear history of past discrimination could be shown. Essentially, as a selection strategy, it requires that a given number of all new applicants selected be from the group or class that was heretofore discriminated against.

The quota model placed great emphasis on a qualitative evaluation of past history as it related to equal opportunity. The model defined fairness in terms of a qualitative judgement about the history of employment practices. For example, if this model was applied to an employment selection situation in which it was shown that discrimination against women had been a command practice for many years, a fair solution may mandate that

for every male hired a female must also be hired. This solution would apply only to females who were at least minimally qualified and would be discontinued once an acceptable ratio of the work force was female. This model would be highly regarded by members of a least-favored group who were concerned about the group's welfare.

The Equal Risk Model

As to the second criticism, that traditional selection strategies did not afford each person an equal opportunity of being selected, R. M. Guion (1966) suggested the following definition of fairness.

> Unfair discrimination exists when persons with equal probabilities of success on the job have unequal probabilities of being hired for the job.[6]

In 1971, Einhorn and Bass quantified the above probabilities in a model referred to as the equal risks model of fairness. This model keyed in on an applicant's test score X and his probability of being successful on the job. The shift of emphasis to a person's test score X was a marked departure from the regression model's emphasis on a person's predicted score Y'. It also emphasized outcomes that were not considered by the regression model.

For any given employment decision regarding selection, there are four possible outcomes.

1. An applicant is selected who will be successful on the job.
2. An applicant is rejected who would have been successful on the job had he been selected.
3. An applicant is rejected who would have been unsuccessful on the job had he been selected.
4. An applicant is selected who will not be successful on the job.

These outcomes are shown in figure 2. The first and third outcomes are desirable and the second and fourth outcomes are undesirable. The equal risk model attempts to equalize the chances of an applicant's being accorded outcome two and an employer's being accorded outcome four.

Possible Outcomes

	Rejected	Selected
Would Succeed	Outcome 2	Outcome 1
Would Not Succeed	Outcome 3	Outcome 4

Figure 2

The Equal Risk model requires that the predictor cut score Xc be determined for each group or class in a way that will accord an equal probability of being selected for applicants within each group or class. It attempts to maximize both the employer's desire to obtain personnel who are most likely to be successful on the job and the candidate's desire to be employed. Such an attempt will afford some risk to the desires of both the employer and the candidate for employment. The equal risk model as a selection strategy attempts to equalize the risk for each party. In this sense, it may be regarded as a compromise position.

Code (1973) gave the following example of a hypothetical employment situation to illustrate how the cutoff points would be adjusted when the equal risks model is used.

> For example, suppose a selector is willing to hire all applicants with at least a 70% chance of success (or a 30% risk) as gauged by the predictor variables used. Then the predictor cutoff is chosen at the point at which the criterion pass point (Yp) is approximately one-half the standard error of estimate ($\sigma_{y.x}$) below the predicted criterion (y) since about 70% of the cases fall above minus one-half standard deviation in a normal distribution.[7]

Thus, if this model were applied to the employment situation above, the cutoff point would have to be adjusted to accept all job contenders who demonstrate a 70% chance of being successful and all those candidates who exceeded the cutoff would be equally considered for hire.

The Regression Model

In 1968, Anne T. Cleary reaffirmed the use of a regression model. Cleary performed separate regressions of Y on X (Y being a criterion of successful college achievement and X being scores on the Scholastic Aptitude Test (SAT)) for a group of white students and a group of black students. This was done at several integrated colleges. At each college, the regression lines for blacks and whites were compared for equality of slopes and equality of intercepts. Cleary points out that the regression model is a fair strategy for selection when the slopes and the intercepts of regression lines are equal for each group or class for which a prediction is to be made. Only one college was found in which the regression lines for blacks and whites were significantly different, and at this college, the black students scores were overpredicted. Thus, if a common or a white regression line was used as a basis for selecting students for admission to this college, there would be bias in favor of admitting blacks while whites would be penalized.

Cleary defined test bias as follows:

> A test is biased for members of a subgroup of the population if, in the prediction of a criterion for which the test was designed, consistent nonzero errors of prediction are made for members of the subgroup. In other words, the test is biased if the criterion score predicted from the common regression is consistently too high or too low for members of the subgroup.[8]

Under such conditions, a test would be considered as unfair. (Note: When the intercepts are not equal, consistent nonzero errors of prediction are being made.)

The Constant Ratio Model

The third criticism leveled against traditional selection strategies was that their use may result in fairness being accorded to individuals within a group but not to the group as a whole. This issue was not addressed until 1971. At this time, Thorndike pointed out that a strategy of selection considered fair by the regression model for individual members in both a minority and a majority group could in actuality be unfair for the minority group as a whole. He keyed in on the predictor scores X and demonstrated that, when the majority and minority groups differed appreciably in mean test scores on X, it would produce a situation that was fair to individual members of the group scoring lower on the test but unfair to the lower scoring group as a whole.

Thorndike's solution to this problem was a constant ratio model in which members from each group were selected in accordance with the proportion of a group's selected candidates for the job (Sc) to their original contenders for the job (Oc). For example, consider a job situation in which there were 40 contenders for a job - 20 males and 20 females. Of the 40 original contenders, 12 males and 8 females met or exceeded the minimum qualifications for the job and became candidates. For the constant ratio model, a state of fairness exists when minimum performance scores are set at levels that will qualify applicants in each group in proportion to So/Oc. If the probabilities for outcomes shown in figure 2 were quantified, the constant ratio model could be expressed as a ratio of (outcome one + outcome four)/ (Outcome one + outcome two). Peterson and Novick (1976) described the probability outcomes for six different models of fairness and compared them using a similar but more detailed notation. In our contrived example, the proportion of male contenders to male candidates was 12 to 20 or 60%, and the proportion of female contenders to female candidates was 8 to 20 or 40% (3/5 = 60% and 2/5 = 40%). Thus, if the constant ratio model were used, the criterion performance score would be adjusted to include a ratio of 60% males to 40% females, or for every 3 males hired, 2 females would be hired. For many current job situations, this model of fairness would most likely be preferred by women.

The Subjective Regression Model

In 1971, R. B. Darlington considered four previous models of fairness and recommended a common sense approach, which he called the subjective regression model. Darlington maintained that optimum treatment of cultural factors in test construction or test selection cannot be reduced to completely mechanical procedures. He argued that a subjective policy-level decision must be made when conflict arises between the two goals of maximizing a test's validity and minimizing a test's discrimination against a given cultural group. Darlington's model suggests that a test is fair when a proper balance between performance considerations and social and cultural considerations is obtained.

The subjective regression model requires both a performance measure (Y) and a cultural measure (C) for which a value estimate (K) is made. Darlington maintains that, once this datum is available, an investigator can specify a linear function of Y and C, or (Y-KC) which maximizes the balance between performance and cultural considerations. For example, in the employment situation described for the constant ratio model above, there were 40 original contenders for the job and half of them were minimally qualified and therefore became candidates. Twelve of

the candidates were male and eight female. Let's assume further that the scores for the candidates were as follows: the four highest scores were made by males, the fifth highest was made by a female, and the two lowest scores were made by a male and a female who were both of Spanish-speaking origin. It is noted that all candidates for the job in question are minimally qualified. If the subjective regression model were used as a selection strategy for the above job situation, values for C and K would be needed.

It would be necessary to assign some value (c) that favors one culture group when compared with another. Let's assume that the female of Spanish-speaking origin was assigned a least favored score, from the standpoint of cultural differences, of zero, (C=0) on a zero to ten scale, and that her performance score was 70 (Y=70). Also assume that the highest male performance score was 90, or (Y=90); and his score based on cultural differences was a most favored score of 10 or (C=10). Finally, let's assume that the value estimate for K was .2.

If the subjective regression model was used as a selection strategy for the job situation described above, the highest scoring male (Y=90) and lowest scoring female of Spanish-speaking origin (Y=70) would have equal scores for selection purposes. The male's score would be Y-KC=90-(.2) (10) = 70 and the female's score would be Y-KC=70-(.2)(0) = 70. Both would have selection scores of 70 and be equally considered for the job.

In a recent article by Darlington (1976), the task of determining a value to be used for C and K was acknowledged as being very difficult to perform. In this article, Darlington reaffirmed his support for a rational selection model and introduced two new methods whereby cultural factors could be included in the selection strategy. This resulted in a change in his methodology but not in his basic point of view.

The Conditional Probability Model

The next model of fairness to be considered is the conditional probability model. This model was advocated by N. S. Cole (1973). The model is similar to the constant ratio model in that it addresses the issue of group fairness as well as individual fairness. It favors the applicant's point of view at the expense of the employer and offers a solution to the undesirable outcome in which an applicant is rejected who would have been successful on the job had he or she been selected.

It differs, however, from the constant ratio model in the basic formulation of minority and majority group selection practices. Under the constant ratio model, selection for each group was made in accordance with the proportion of selected candidates (Sc) to original contenders (Oc) or Sc/Oc. Under the conditional probability model, the basis for selection was described by Cole as follows:

> The basic principle of the conditional probability selection model is that, for both minority and majority groups whose members can achieve a satisfactory criterion score ($Y > Yp$), there should be the same probability of selection regardless of group membership.[9]

The importance of an equal probability of being selected is amplified when one considers the fact that, at the time a selection is made, only the predicted criterion Y is known for each candidate; at this time the candidate's true score Y is yet to be determined.

For the conditional probability model, selection is considered as fair when the predictor cut scores Xc on each group are chosen so that a constant probability of selection will be accorded all applicants who have potential of being successful if given the chance.

If the applicants with potential for success from the majority group are accorded a 70% probability of being selected, then the applicants with potential for success from a minority group must be accorded the same conditional probability.

Again, if the possible outcome shown in figure 2 were quantified, the conditional probability model could be expressed as a ratio of (outcome one) / (outcome one + outcome two).

If this model of fairness was used in our contrived employment situation described for the constant ratio model above, we could expect the following: First, for each group the predictor scores would be adjusted until an equal conditional probability is accorded each group; then all candidates would be given an equal chance of being selected regardless of group membership. Let's assume further that only three persons were to be hired. Under such constraints, we would expect the three persons to be hired to be a male, a female, and a person of Spanish-speaking origin.

The Equal Probability Model

In 1973, Linn described a model that was later referred to as the Equal Probability Model. This model keys in on the applicants' scores on the predictor scores X for each group, and considers the probability of success of all applicants who are selected. Again, referring to figure 2, it is noted that two outcomes are possible for applicants who are selected. Outcome one and outcome four. If the probability of these outcomes was quantified, the equal probability model could be expressed as a ratio of (outcome one) / (outcome one + outcome four). This ratio could be determined for each group, and when the ratio was equal to a fixed constant for each group, selection by this model would be regarded as fair.

Consider a job situation in which 20 males and 20 females were selected as candidates for a job. After being hired and working on the job, 12 males proved to be successful and 8 females were successful. Thus, 8 males and 12 females were unsuccessful. If the equal probability model was used as a selection strategy for this job situation, one would expect further hires to favor women being selected.

Recent Models

During the last two years (1975 - 1976), a number of new models have been discussed in the literature. The thrust of these new models will be briefly considered beginning with the Threshold Utility Model. This model was first suggested by Gross and Su (1975) and later by Peterson. Peterson and Novick (1976) discussed this model within the framework of a rational decision-making paradigm. This model was to serve as a means for maximizing expected utilities given different points of view as to what constitutes utility. What is of great value from the point of view of an employer may not be considered as being as valuable from the applicant's viewpoint and vice versa. The threshold model recommends that a summarization of values from various points of view be made and that the decision with the highest utility pay off be accepted as being essentially fair.

Peterson and Novick (1976) introduced four new models that were converse to models that had previously been discussed. These are (1) the converse equal risk model, (2) the converse constant ratio model, (3) the converse conditional probability model, and (4) the converse equal probability model. The converse models were not presented by Peterson and Novick as desirable selection strategies; the models were merely introduced to make the previous models coherent within the decision-making paradigm they have committed themselves to. In effect, the converse models were used to show that their counterparts were inconsistent with the rational decision-making paradigm.

Another noteworthy model recommended this year was one by Lindley (1976) called the Normal Ogive Model. This model attempts to quantify those crucial decisions that Darlington left to a common-sense rational judgement. Also noteworthy is the fact that a computer assisted data analysis (CADA) system is being developed to complement this selection strategy. The normal Ogive Model along with twelve other models and the sources that recommended them, are listed in figure 3.

The Current Solutions Being Advocated

Presently, there are three distinct schools of thought about how the puzzle of fair selection may be solved. These have been identified and interpreted as follows:

a. One school of thought holds that a quantitative mathematical approach be used and that solutions that are formulated remain within the constraints of a rational decision-making paradigm. Value is based on, and equated with, the utility of outcomes that result from decisions made; and the worth of a selection strategy is judged on the basis of the sum total of the utility it affords. The solutions advocated by Petersen and Novick can be identified with this line of thinking.

b. Another school of thought holds that a quantitative mathematical approach be used as a practical tool to arrive at solutions to problems that are spawned from human concerns. In essence, the final outcome justifies the process that is used. The solutions advocated by Sawyer, Cole, and Cole can be identified with this line of thinking.

c. Another school of thought holds that a strict mathematical/mechanical method will never be formulated to capture fairness within the overall selection process, and that, any mathematical formulation must be augmented by human judgement in areas where value is an issue. Solutions advocated by R. B. Darlington can be identified with this line of thinking.

Much could be said in favor of school (a). However, it is much too early to pass judgement on such an approach. In mankind's intellectual history, the use of paradigms has been both beneficial and detrimental. For example, Aristotle developed a form of logic that was confined to a syllogistic paradigm that was without doubt beneficial to mankind at one point in history but was later detrimental. The syllogistics paradigm was so well formulated that alternate approaches were not ever seriously considered until the 20th Century. Nevertheless, an approach that calls for clearness and precision is to be commended--be it syllogistic or rational decision paradigm.

As for school (b), it also has strengths and weaknesses. Two important tendencies that need to be considered about school (b) are its use of mathematics as a tool and its refusal to be stifled by formality. School (b) does not begin with a formal value commitment that is consistent across all concerns. However, if an imperfectly formulated process leads to a desirable outcome that satisfies human concerns about employment decisions, it must be accorded some worth. After all, many human concerns about the selection process have not been brought under a consistent, systematic value theory. The weakness of school (b) lies in its lack of formal structure while its strength is in its responsiveness to human concerns.

As for school (c), its strength would lie in its ability to respond to the here and now. If a consistent coherent mathematical means were available for use within the total selection process, by all means it should be used. However, as of now, this is not the case. For example, little, if any, attempt has been made to quantify utilities associated with the outcome in which a person's situation is not improved (figure 3). The psychological, social, economic, legal, and political utilities of this outcome stand as an awesome task for any school to evaluate.

In final analysis, the issue of fairness has not been resolved; however, it is being vigorously pursued with precision, concern, and common-sense.

Axiological Models of Fairness

Model	Recommended by
Regression Model	This model has traditionally been used as a selection procedure. It was reaffirmed by A. T. Cleary 1968, A. Anastasi 1968, Q. McNemar 1975.
Quota Model	Numerous court decisions within the last ten years.
Equal Risk Model	R. M. Guion 1966, H. J. Einhorn and A. R. Bass 1971.
Constant Ratio Model	R. L. Thorndike 1971
Subjective Regression Model	R. B. Darlington 1971
Conditional Probability Model	N. S. Cole 1973
The Equal Probability Model	Linn, 1973 (discussed by)
The Threshold Utility Model	Gross and Su, 1975 later Petersen
The Converse Equal Risk Model	Petersen and Novick 1976.
The Converse Constant Ratio Model	Petersen and Novick 1976.
The Converse [illegible]tional Probability M[illegible]	Petersen and Novick 1976.
The Converse Equal Probability Model	Petersen and Novick 1976.
The Normal Ogive Utility Model	Lindley (1976) described by Novick and Petersen (1976).

Figure 3

FOOTNOTES

1 Public Law 88-352, as approved by the President on July 2, 1964; Civil Rights Act of 1964 with Explanation. Commerce Clearing HOuse, Inc., Chicago 46, Illinois 1964, page 71.

2 Supreme Court of the United States. 401 US 424, Griggs et al versus Duke Power Company. No. 124 - October Term, 1970 (Decided March 8, 1971).

3 Subcommittee on Labor of the Committee on Labor and Public Welfare United States Senate; The Equal Employment Opportunity Act of 1972; U. S. Government Printing Office; Washington 1972. page 16.

4 Equal Employment Opportunity Coordinating Council; Uniform Guidelines on Employee Selection Procedures, Federal Register, Vol 41, No. 136 - Wednesday, July 14, 1976.

5 Equal Employment Opportunity Coordinating Council.

6 Guion, R., Employment tests and discriminatory living. Industrial Relations, 1966, 5, 20-37, page 26.

7 Cole, Nancy S., Bias in Selection, Journal of Educational Measurement, vol 10, No. 4., Winter, 1973, 237-255, page 239.

8 Cleary, Anne T., Test Bias: Prediction of Grades of Negro and White Students in Integrated Colleges; Journal of Educational Measurement, vol 5, No. 2, Summer, 1968; 105-124, page 115.

9 Cole, Nancy S., (1973) page 240.

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